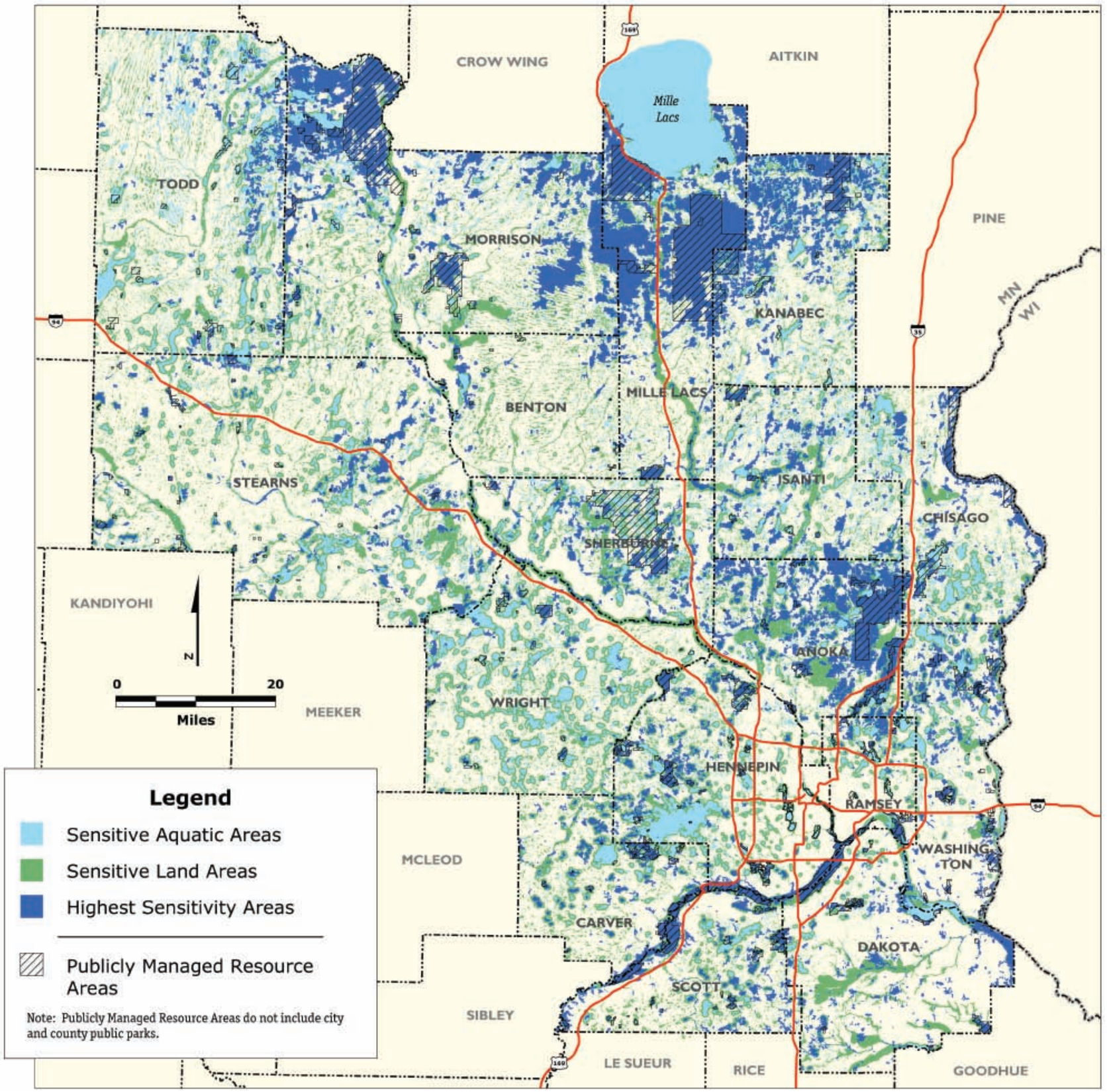
2006

Growth Pressures on Sensitive Natural Areas

Institute on Metropolitan Opportunity
University of Minnesota Law School

Map 13. DNR Central Region: sensitive natural areas



Source: *Growth Pressures on Sensitive Natural Areas in DNR's Central Region.*

Creation of the Sensitive Natural Areas Map

The creation of this 17-county GIS map by DNR's Central Region staff combines 19 different, existing data layers of varying ages. While some data sets are relatively current, others like the National Wetlands Inventory date back to 1979-1988. As a result, this map represents a "still shot in time" and the best approximation of remaining regional natural resources in 2005. Undoubtedly, this map overestimates the remaining sensitive natural areas in the region because land cover changes occur rapidly on a daily basis throughout much of DNR's Central Region. Conversely, the map underestimates land in public protection, since county and city parks and privately owned lands such as corporate and academic land holdings are not included in the Publicly Managed Resource Lands overlay.

An essential step in the overall analysis was the creation of a region-wide Sensitive Natural Areas (SNA) map. Initially, three separate natural resource layers were developed using different databases: Highest Sensitivity Areas, Sensitive Aquatic Areas, and Sensitive Land Areas. These three layers were then combined to create the final SNA map. Although natural resources are not constrained by jurisdictional boundaries, municipal boundaries were overlain on the resource map for purposes of analysis by cities and townships. By aggregating the three categories of sensitive natural areas and calculating percentages by municipality (Map 14), remaining sensitive natural areas could be compared directly with demographic, fiscal and economic data used in analysis by Ameregis.

The data sets used in the creation of the three separate natural resource layers included:

Highest Sensitivity Areas:
Minnesota County Biological Survey (MCBS) Native Plant Communities (varies, 1986-present; excludes MCBS surveys for some counties); MCBS Sites of Biodiversity Significance (varies, 1980-present); Regionally Significant Ecological Areas (2000); Forest Core Patches (1991-1993).

Sensitive Aquatic Areas:
Shallow Lakes (2004); Natural Environment Lakes (2004); Scientific and Natural Area (SNA) Lakes (2004); Outstanding Resource Value Water (ORVW) Streams (2004); Trout Streams (2002); Calcareous Fens (2004); Public Water Basins (2004); Wetlands (1979-1988; from the National Wetlands Inventory, Cowardin classes 4 through 8).

Sensitive Land Areas:
Shoreland Management Zone—Natural Environment Lakes (2004); Shoreland Management Zone—Shallow Lakes (2004); Trout Stream Protection Zone (2004); Calcareous Fen Protection Zone (2004); SNA Lake Protection Zone (2004); Shoreland Management Zone—All Other Public Water Lakes (2004); Steep Slopes (1997); Wetlands (1979-1988; from the National Wetlands Inventory, Cowardin classes 1 through 3).

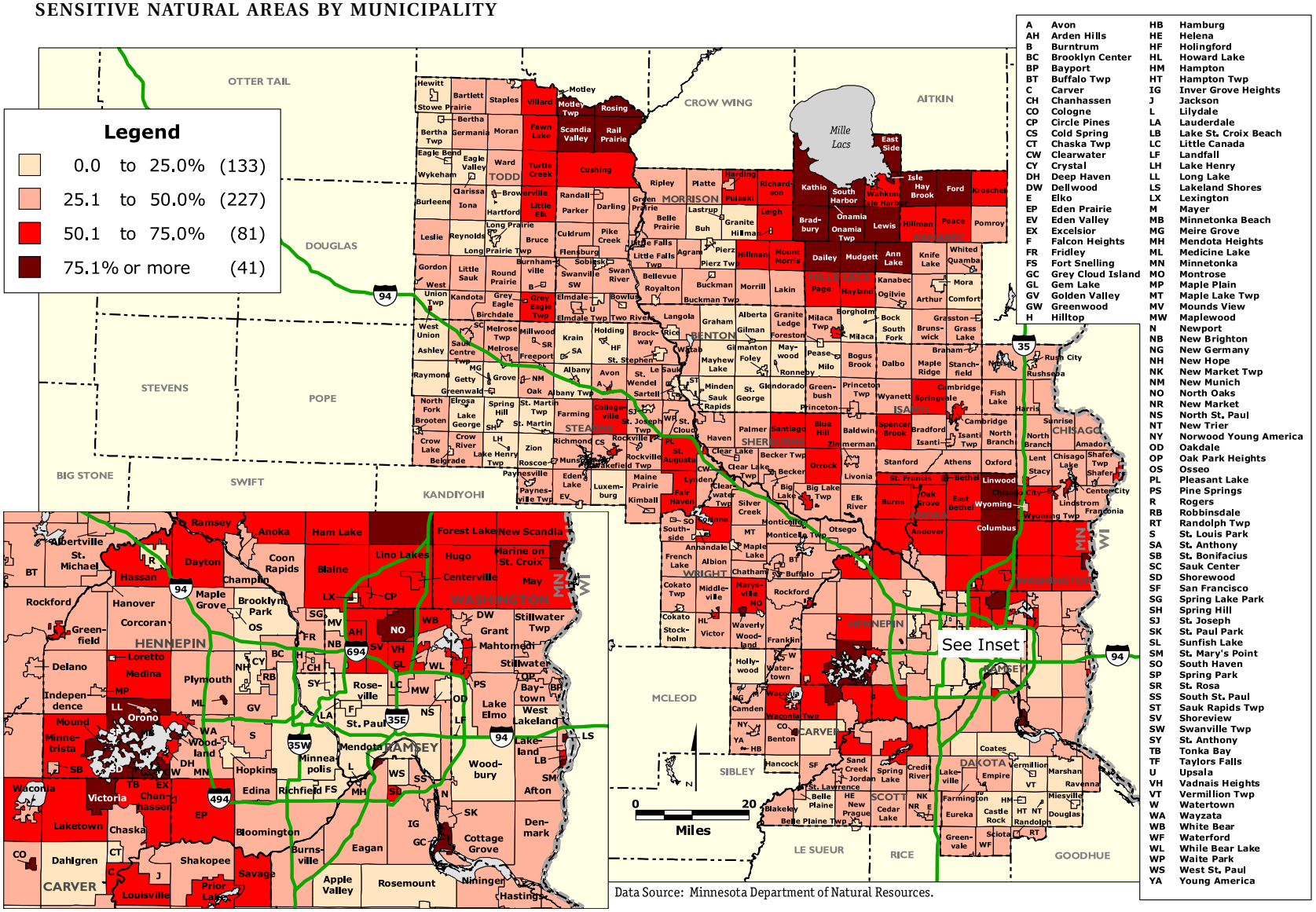
As a final caveat, this regional mapping of natural resources is not of sufficient resolution to detect remaining natural resources at the local level. Ground truthing is required to verify the presence and distribution of resources at this scale.

ameregis

1313 Fifth Street SE, Suite 119
Minneapolis, MN 55414
(612) 379-3926
www.ameregis.com

Central Region
1200 Warner Road
St. Paul, MN 55106
(651) 772-7900
www.dnr.state.mn.us

MAP 14. MINNESOTA DNR CENTRAL REGION: PERCENTAGE OF TOTAL AREA DESIGNATED AS SENSITIVE NATURAL AREAS BY MUNICIPALITY



Data Source: Minnesota Department of Natural Resources.

The mapping of sensitive natural resources used data from several sources to classify sensitive land and water areas (Map 13 for more detail). Roughly 40 percent of the area in DNR's 17-county Central Region falls into one of three sensitive categories. Although there are large tracts of publicly owned lands protected from development in the region, most of the sensitive resources are scattered and unprotected. Only 14 percent of sensitive areas, or six percent of total surface area, is protected in the Central Region.

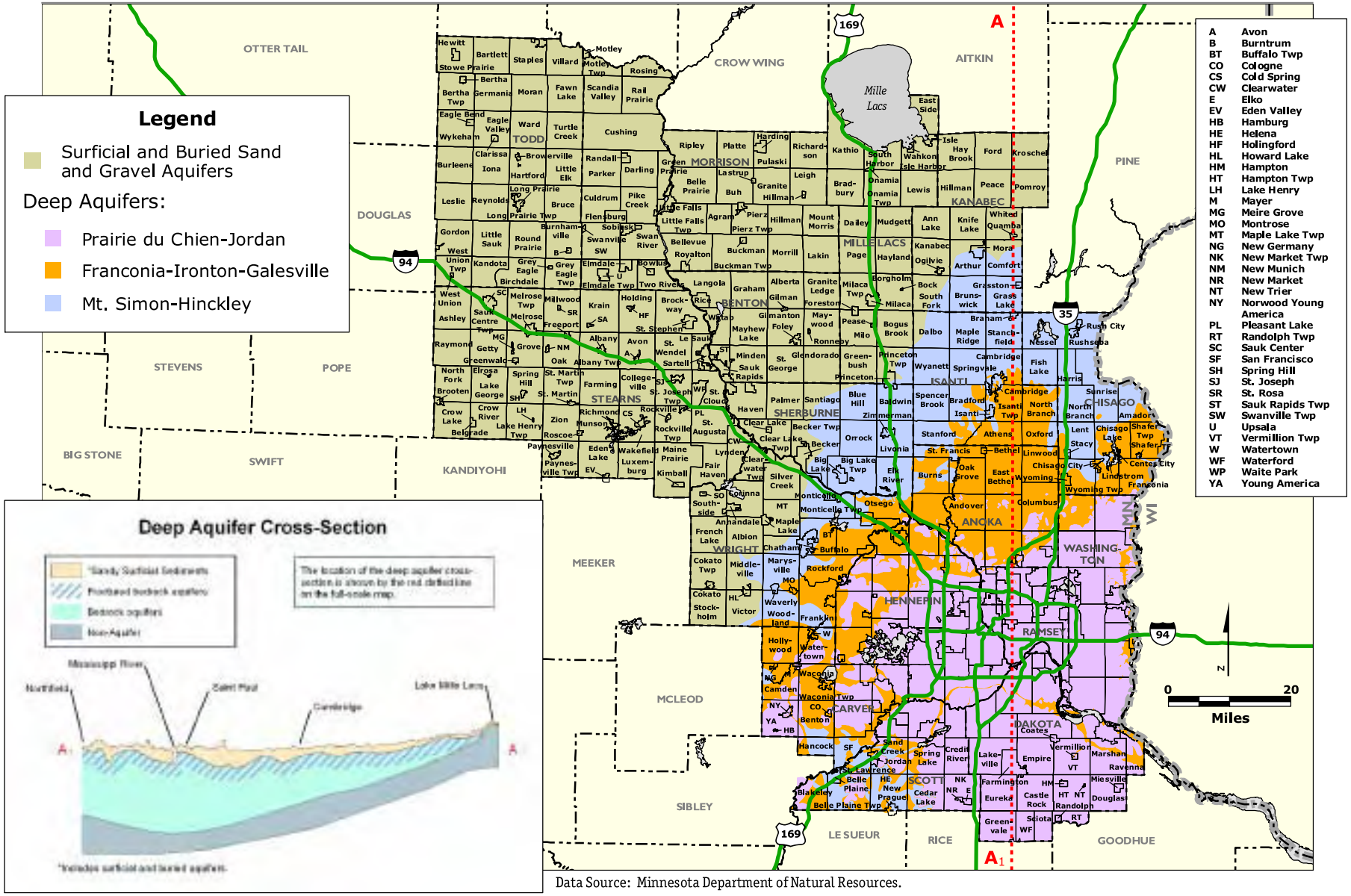
Varying Regional Water Sources

DNR's Central Region has relatively large supplies of ground water for residential, commercial and industrial uses. About 1.83 million residents in the 7-county metropolitan area obtain their water from bedrock aquifers that underlie much of the Twin Cities metropolitan area. These groundwater sources include the Prairie Du Chien-Jordan (PDC-Jordan), Franconia-Ironton-Galesville (FIG), and Mt. Simon-Hinckley (Mt. Simon) aquifers. Treated drinking water for an additional 870,000 people comes from the Mississippi River. In the 7-county core region and in the inner portions of the adjacent "collar" counties (Wright, Sherburne, Isanti, Chisago), both bedrock aquifers and the Mississippi River supply significant amounts of water. Although there have been reported incidences of interference with surface water features, such as fens and wetlands, in the core area of the region, DNR's Waters Division believes that, if managed carefully, these combined ground and surface water sources can supply enough water to meet future growth and development in the southern portion of DNR's 17-county Central Region (Purple, orange, and blue areas of Map 15).

The water supply situation clearly changes in the northern half of DNR's Central Region. As can be seen in the insert of Map 15, the water-bearing bedrock aquifers gradually disappear in the vicinity of the northern collar counties and groundwater sources are restricted to unconsolidated sand and gravel deposits that can be at or near the land surface. These water-bearing deposits vary in thickness and in some areas in Central Region can be virtually non-existent. They are also spatially scattered and the locations of the buried sources are poorly known. Although these water sources are primarily used for low-volume domestic supplies and seasonal irrigation, it is uncertain whether these surficial and buried aquifers will be able to sustain increased withdrawals to meet the expected demand of 100,000 new residents in this portion of DNR's Central Region. Moreover, these shallow sand and gravel aquifers allow rapid infiltration of surface water, making these aquifers highly susceptible to contamination. In the future, the Mississippi River might prove to be the more reliable source of water supply for future development, although river water dependence will bear costs associated with water treatment and piping to location.

As growth occurs in DNR's Central Region, it will be important to balance the needs of water-dependent natural habitats with the water needs for homes, businesses, energy, and agriculture. To conserve the region's remaining sensitive natural resources, water managers will need to take into account the impacts of groundwater withdrawal on sensitive natural areas such as groundwater-fed lakes, trout streams, springs, fens, and seepage swamps (photo). Even if groundwater does not directly feed a lake, wetland, or river, groundwater depletion can result in a lowered water table that negatively affects sensitive aquatic plant communities adapted to specific hydrologic conditions.

Map 15. Minnesota DNR Central Region: groundwater aquifers



Data Source: Minnesota Department of Natural Resources.

The Central Region's deep aquifers, the most reliable sources of water, are available to most of the Twin Cities eleven-county metropolitan area. However, the aquifers become much shallower and less reliable near the boundary of the metropolitan area where much of the region's future growth is expected to occur. The northern portion of the 17-county region depends on groundwater in scattered unconsolidated sand and gravel deposits that are not well-located, less reliable in supply, and highly susceptible to contamination.

Local Tax Capacity

The public actors most often associated in the public's mind with natural resources conservation activities include several federal agencies, state government agencies in all 50 states, and thousands of special districts and counties. However, the role of local governments, with their powers to regulate land use is underestimated. Municipal governments often have the first and last word on whether specific parcels of land can or will be developed.

In many cases, local governments are not particularly well-suited to regulate or protect sensitive natural areas. The full benefits of conserving natural resources are rarely concentrated in a single community. But, at the same time, the costs of conservation can be highly localized. In this situation, local governments do not face the proper incentives to conserve sensitive natural resources. If the benefits of protection are under-valued because many of the benefits accrue to other areas, while the costs are fully borne locally, then local governments can be expected to do too little to protect sensitive natural areas.

This happens not because residents or public officials value the resources any less than others or behave irrationally. Natural assets clearly have value at the local level. Recent initiatives in Woodbury, Eden Prairie, Minnetonka, and St. Cloud to raise local taxes to preserve open space illustrate this.[10] However, local residents often receive only a small portion of the benefits of protection, biasing decisions away from conservation when made solely at the local level.

IN DNR'S CENTRAL REGION, THERE IS A GREAT DEAL OF VARIATION IN THE ABILITY OF MUNICIPALITIES TO FINANCE PUBLIC SERVICES FROM LOCAL TAXES AND LOCAL GOVERNMENTS DO NOT FACE THE PROPER INCENTIVES TO CONSERVE.

Local governments also face a variety of incentives which push them to favor development over natural resource conservation. Local tax policy and land-use regulations are closely related. Local taxes must finance municipal services like police and fire protection and public schools. The amount of revenue a local government can generate on its own depends largely on the value and types of land within its boundaries. If the property tax is the primary local tax, as it is in Minnesota, then local governments have a direct incentive to develop land-use plans that maximize the value of property. Conservation areas rarely meet this standard, at least in the short run.

Different types of development often imply different obligations on the expenditure side of local budgets as well. Commercial-industrial development might enhance the tax base without increasing the demand for school services, for instance. In the end, it is the balance of costs (expenditure needs caused by the development) and benefits (the revenues generated) that local officials care about. Since protected resources rarely generate revenues directly, they often fare poorly in local fiscal decision-making.

One very important characteristic to consider when comparing local government capacity is the ability to raise revenues locally. In Minnesota, the primary local tax instrument is the property tax. State law sets the rate structure for different types of property—the rate per dollar of assessed value is greater for commercial-industrial property than for owner-occupied residential property, for instance. A particular locality's mix of property types then determines how productive its tax base is in terms of revenue generated per dollar of property values. This is the locality's "tax capacity". Local governments then determine their overall tax rate by varying the percentage of tax capacity that they assess.

Tax capacity per household— the revenue that the property tax would generate if the locality taxed its capacity at 100 percent—is therefore the proper measure of local ability to raise tax revenue. Maps 16 and 17 show this measure in 2004 and the percentage change during the prior 11 years for each municipality in DNR's Central Region.

Maps 16 and 17 show a high degree of diversity in the capacity of local governments to absorb the potential costs of natural resource conservation. Tax capacities per household in 2004 varied from as low as $214 per household in the City of Osakis in Todd County to as high as $12,866 in the City of Becker in Sherburne County. The distribution increases relatively smoothly between these extremes and 90 percent of municipalities fall in the range between $865 per household and $4,109 per household.

Tax capacities are, in general, significantly greater in the Twin Cities metropolitan area—average capacity in the 11-county metropolitan area is $2,429 per household compared to $1,546 per household in the 6-county non-metropolitan portion of the region. This reflects the much greater economic vitality in the metropolitan area as well as the higher cost of living.

However, there is significant variation within each of the two parts of the 17-county region. Municipalities in the core and at the fringes of the metropolitan area share lower than average capacities for the most part, while second and third ring suburbs are largely above average. The highest capacities are in the cities located in the western and southwestern suburbs and along the St. Croix River valley.

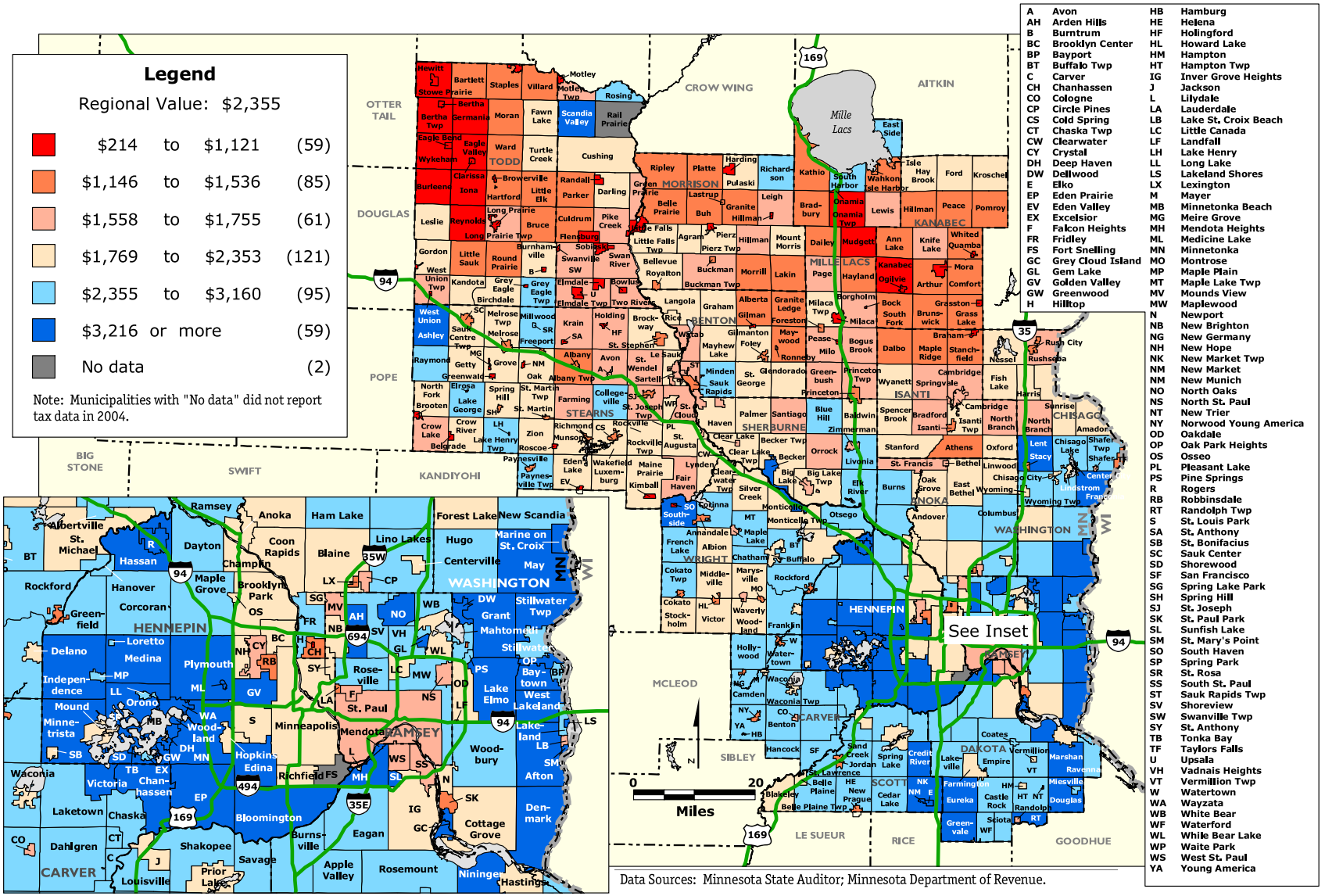
Municipalities in the 6-county non-metropolitan portion of the region are more uniformly below the 17-county average of $2,355. The most striking patterns here are the clusters of much-lower than average capacities in northwest Todd County and in large portions of Mille Lacs and Kanabec Counties.

The situation is not entirely negative in the non-metropolitan counties, however. Tax capacities are increasing more rapidly there, in general than in the metropolitan area—38 percent compared to just 9 percent on average in the metropolitan area—and growth rates were above average in nearly every part of the area.

Tax capacities in virtually the entire core of the metropolitan area grew more slowly than in the rest of the metropolitan area and the 17-county region. Part of the explanation for this is the changes in state law that decreased tax rates on commercial-industrial property compared to residential property. This led to decreased values of tax bases in places rich in commercial-industrial property (like the core area) when compared to places with less commercial-industrial property (like the non-metropolitan portion of the region and many suburbs in the metropolitan area).

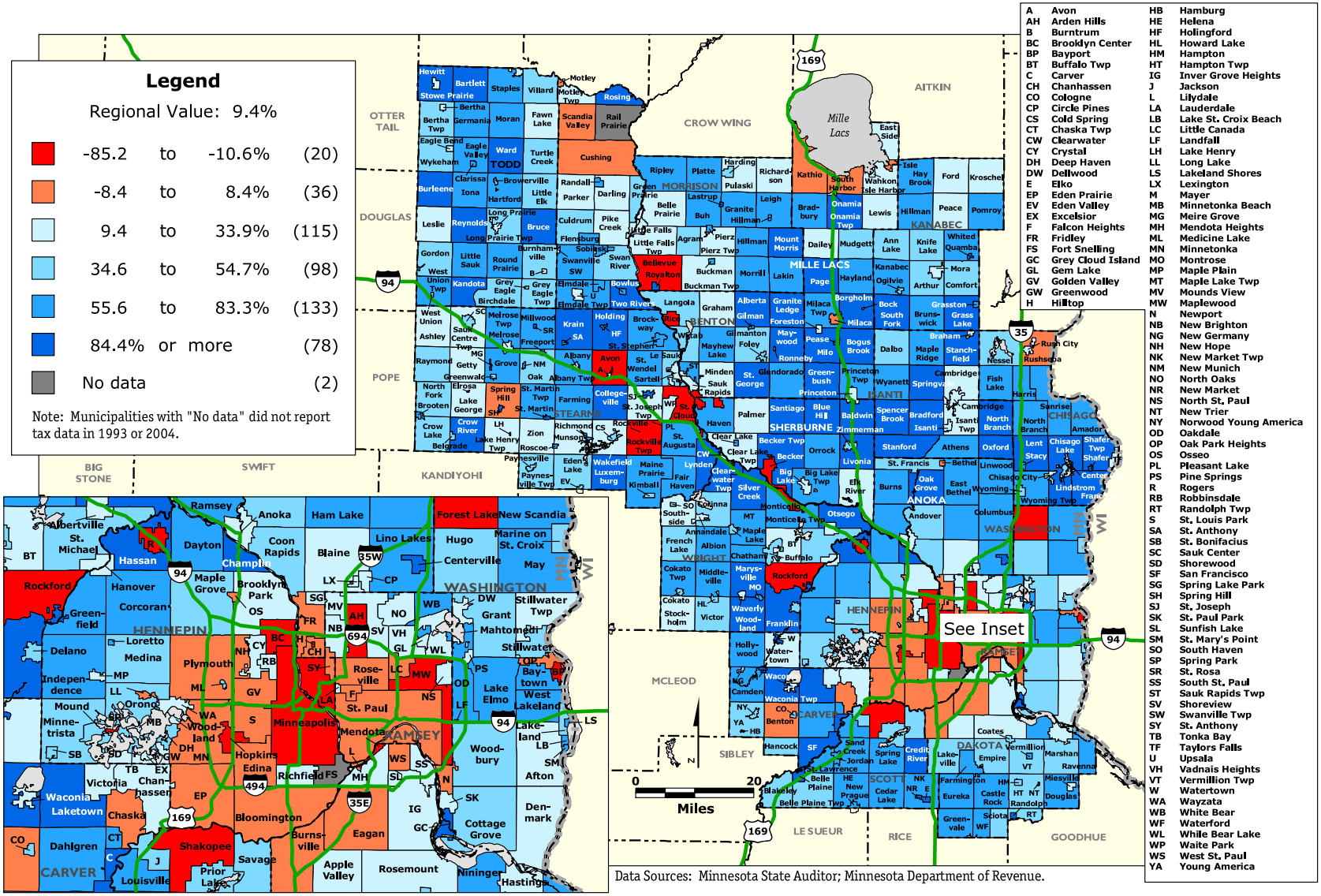
In sum, there is a great deal of variation in the ability of municipalities to finance public services from local taxes. If primary responsibility for conserving sensitive natural areas is left to local governments—through local planning and zoning decisions—the results would be a patchwork quilt of conservation efforts. An analogy would be each community independently planning and paying for its streets and highways with no knowledge of the timing, type, or location of roads being developed in adjacent communities or regionally. The resulting regional system would be inefficient and ineffective.

Map 16. Minnesota DNR Central Region: tax capacity per household by municipality, 2004



Local tax policy and land-use regulations are closely related. Local governments face a variety of incentives that push them to favor development over natural resource conservation. The property tax is the primary local tax, which pushes local governments to develop land-use plans that maximize the value of property. These pressures are greatest where local resources are low. Tax capacity per household—the revenue the property tax can generate given the local mix of commercial-industrial, residential and other types of property—varies dramatically across the Central Region. Tax capacities are highest in the southwest suburbs of the metropolitan area and along the St. Croix valley and lowest on the periphery of the metropolitan area and in the northern half of Central Region.

Map 17. Minnesota DNR Central Region: Percentage change in tax capacity per household by municipality, 1993-2004



Modest growth and changes in state laws governing the property tax have led to lower than average growth in tax capacity in the central cities and inner suburbs of the metropolitan area. Outer suburbs in the metropolitan area and areas along the two major transportation arteries (I-94 and Highway 169) in the six non-metropolitan counties show the greatest growth rates.

Community Classification

Tax capacity is not the only important dimension to consider when evaluating local conditions relating to conservation of natural resources. Local fiscal stress or health also depends on factors affecting the demand side of local budgets (see text box on page 38). These factors must also be considered for a more complete picture of conservation potential.

Metropolitan areas are often viewed as if they are composed of troubled central cities and prosperous suburbs. However, in its studies of numerous metropolitan areas, Ameregis has documented the very wide diversity of communities within metropolitan areas, especially suburban areas. In most metropolitan areas, many fully developed, relatively densely settled suburban areas show signs of stress much like those seen in central cities. In addition, another group of suburbs usually exhibits modest, roughly average, tax bases and high rates of population or job growth—a combination that can also produce stress because of the costs associated with growth.

No single dimension, such as tax base, income or poverty is adequate to describe the diversity of communities in the metropolitan landscape. For this work, cluster analysis was used to group municipalities based on similarities and differences across several dimensions, including both sides of local budgets—the capacity to raise revenues and the need for or costs of providing services.

The analysis was performed separately for the 11-county metropolitan area and 6-county non-metropolitan portions of Central Region. The underlying economy, growth dynamics, tax bases and service costs are dramatically different in the two parts of the region, making a single analysis of the full 17-county area impractical.

The Twin Cities Metropolitan Area

Map 18 shows the results of the analysis for the metropolitan portion of the region. The analysis divided the 269 municipalities in the 11-county region into six groups—central cities, stressed municipalities, developing job centers, bedroom developing communities, developed job centers, and affluent residential areas.

Table 3 (page 37) shows how the groups vary across the characteristics used in the clustering—tax capacity per household, jobs per household, poverty rate, household growth from 1993 to 2003, household density, and median housing age.

Two groups—central cities (2) and stressed municipalities (53)—are home to 47 percent of metropolitan households. These two community types, found largely in the core of the region, show a combination of capacities and costs that imply significant fiscal stress. In these places, lower than average tax capacities are combined with higher than average cost factors. Notable cost factors include: significant job concentrations that increase demand for services by non-residents; higher poverty rates that increase needs; much greater than average household densities that can create congestion costs; and greater than average housing ages which generally indicate older infrastructure that is more expensive to maintain or upgrade.

Another group of 58 developing job centers, representing 25 percent of households, shows roughly average tax capacity and some higher than average cost characteristics. In particular, these places are likely to be stressed by growth—they show the highest growth rates for both households and jobs among the six clusters. Developing job centers lie in two arcs of second ring suburbs in the southern and northern parts of the metro and along the I-94 corridor to the northwest.

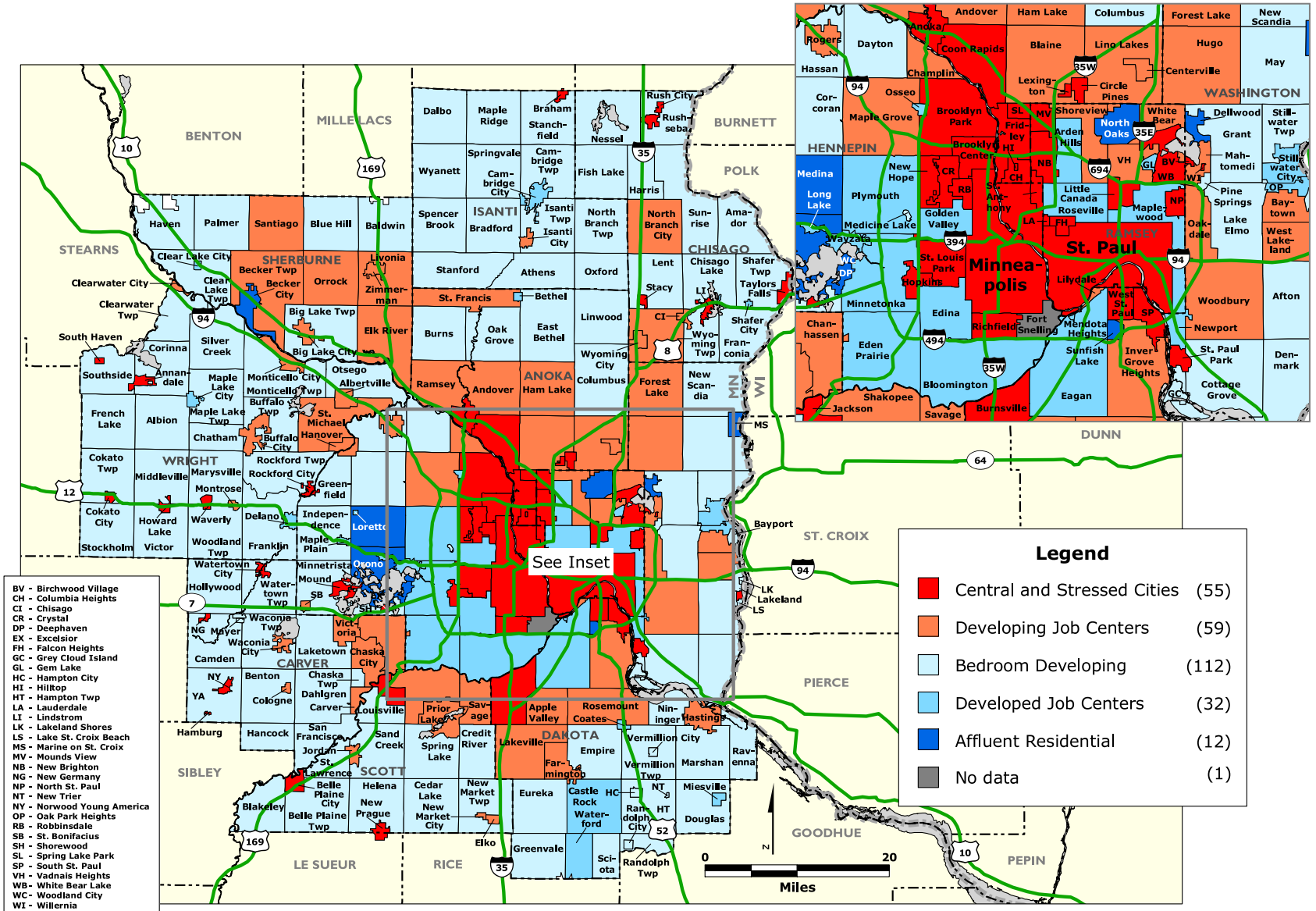
The bedroom developing group consists of 112 municipalities at the perimeter of the metropolitan area and represents 8 percent of households. It is similar to the developing job centers except that these places do not show job concentrations like those in the job centers. They also show roughly average tax resources coupled with rapid population growth.

DNR'S CENTRAL REGION SHOWS A WIDE VARIETY OF COMMUNITY TYPES ESPECIALLY IN THE SUBURBS. SOCIAL AND FISCAL STRAINS ARE NOT LIMITED TO OLDER URBAN AREAS.

The final two community types—32 developed job centers and 12 affluent residential areas—are largely second ring suburbs across the south and west of the region and in the area around Lake Minnetonka. They show few signs of stress. Representing just 20 percent of regional households, these places enjoy relatively rich tax bases with few cost factors.

In sum, like most metropolitan areas, the Twin Cities region shows a great deal of diversity in community types, especially in the suburbs. Just under half of the region's households live in places showing clear signs of stress and another third live in communities that must plan carefully to manage the costs of growth with only average local resources.

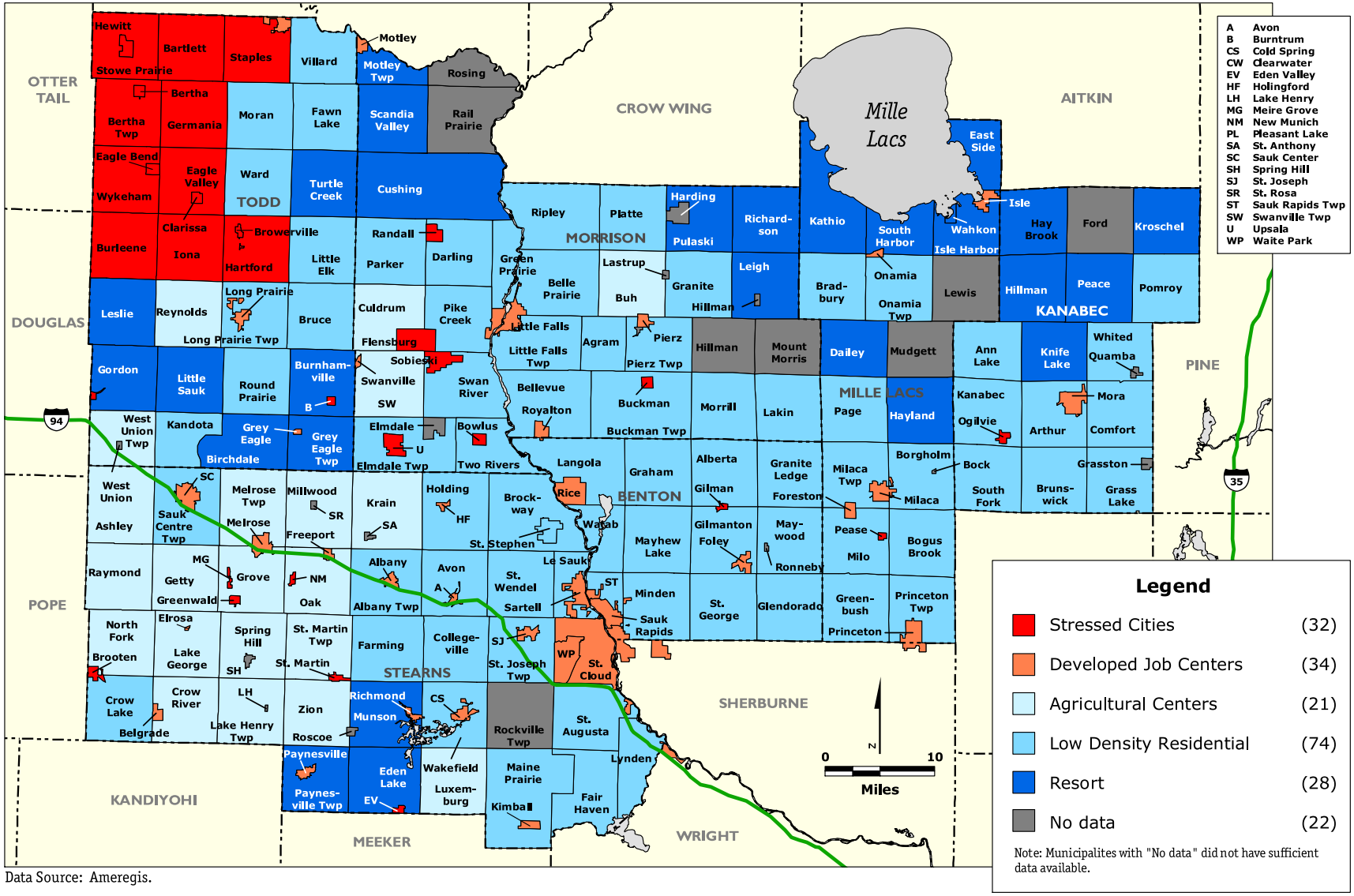
Map 18. Twin Cities 11-County Metropolitan Area: community classification



Data Source: Ameregis.

Classifying municipalities helps demonstrate the combined effects of a local government's fiscal capacity and the costs it faces in providing services. In the metropolitan area, the two central cities and a group of more than 50 suburban communities show a combination of lower than average fiscal capacity and greater then average cost factors that implies significant fiscal stress. Nearly half of the region's households reside in these places. Two other groups, containing another third of households are coping with the greatest growth rates with average tax capacities. Only one in five households lives in areas with a combination of high tax capacities and low costs.

Map 19. Minnesota 6-County Non-Metropolitan Area: community classification



Data Source: Ameregis.

Two groups of municipalities in the six non-metropolitan counties—Stressed and Developed Job Centers—show clear signs of fiscal stress. Developed Job Centers are the area's traditional economic centers and are home to nearly 60 percent of households in the six counties. Only about a third of the area's households live in municipalities with a combination of higher than average tax resources and lower than average cost factors.

The 6-County Nonmetropolitan Region

Map 19 and Table 4 show the results of the analysis for the 6-county non-metropolitan portion of the region. The analysis separated the 189 municipalities in this part of the region into five groups—stressed municipalities, developed job centers, agricultural centers, low density residential areas, and resorts.

The table shows how the groups vary across the characteristics used in the clustering. The clustering variables are the same as those used in the 11-county metropolitan area with the addition of two variables—the percentage of residents employed in agriculture and the percentage of housing that is seasonal.

Both the stressed municipalities and the developed job centers show significant signs of fiscal stress. The 66 municipalities in these groups represent 63 percent of households in the 6-county non-metropolitan region. Both groups show lower than average tax capacities. Tax capacities are especially low in the stressed group. These places are in the farthest reaches of the region, for the most part, in northwestern Todd County.

© Peggy Booth, MnDNR

The developed job centers represent the traditional regional centers like Onamia, Long Prairie and Sauk Center and one larger city—St. Cloud. Tax capacities in this group are just below average and stagnant, showing essentially no growth between 1993 and 2004. The cost factors facing them relate primarily to their function as central places in their local economies—the costs of providing services to non-resident workers and others who use local public and commercial facilities—but they are also growing faster than average.

The second largest group—74 low-density residential areas representing 27 percent of total regional households—is spread across the southern and eastern parts of the six county area. They are relatively stable places with tax capacities a bit higher than average and the lowest average poverty rate of the six groups.

A relatively small group of agricultural centers—21 municipalities with 3 percent of households—shows slightly higher tax capacity coupled with very slow growth and very low densities.

Finally, the resorts—28 places with 8 percent of the region's households—show the highest tax capacities per household and the greatest household growth rates. These places are clustered around Mille Lacs, in northeastern and southwestern Todd County and in southern Stearns County.

Just as in the Twin Cities metropolitan area, the 6-county non-metropolitan portion of the region shows very significant diversity. Roughly two-thirds of the area's households reside in communities with significant signs of stress—places that could shoulder the burden of conserving sensitive natural areas only with great difficulty.

Table 3: Characteristics of the Community Types — Twin Cities Metropolitan Area | Variables Included in the Cluster Analysis

Community Type	Number	Percentage of Regional Households	Tax Capacity per Household 2003	Jobs per Household 2003	Poverty Rate 2000	Percentage Growth in Households 1993-2003	Households per Sq. Mile 2003	Median Housing Age 2000
Central Cities	2	24	1,821	1.7	16	1	2,972	58
Stressed	53	23	1,943	1.2	6	7	1,371	32
Developing Job Centers	58	25	2,503	1.0	3	56	364	14
Bedroom Developing	112	8	2,639	0.3	3	24	36	29
Developed Job Centers	32	19	3,375	2.3	3	15	793	30
Affluent Residential	12	1	7,047	0.9	2	19	173	3
Total	**269**	**100**	**2,429**	**1.4**	**7**	**18**	**287**	**27**

Table 4: Characteristics of the Community Types — 6-County Non-metropolitan Area | Variables Included in the Cluster Analysis

Community Type	Number	Percentage of Regional Households	Tax Capacity per Household 2003	Jobs per Household 2003	Poverty Rate 2000	Percentage Growth in Households 1993-2003	Households per Sq. Mile 2003	Median Housing Age 2000	Percentage of Housing Seasonal 2000	Percentage of Work Force in Agriculture
Stressed	32	6	785	0.5	12	5	17	46	4	9
Developed Job Centers	34	57	1,442	1.9	11	31	638	31	1	1
Low Density Residential	74	27	1,710	0.3	6	19	13	28	5	7
Agricultural Centers	21	3	1,949	0.2	10	9	5	41	3	33
Resort	28	8	2,115	0.2	11	43	10	28	40	8
Total	**189**	**100**	**1,546**	**1.2**	**10**	**26**	**26**	**33**	**7**	**5**

Sources: U.S. Bureau of the Census, Minnesota State Auditor.

Cluster analysis: How it works

Because there are more than 450 jurisdictions included in the study area, it is impossible to individually measure each one against the others. Instead this assessment relies on a statistical procedure called cluster analysis to assign municipalities to groups that are as internally homogeneous and as distinct from one another as possible, based on specified social, fiscal and physical characteristics.[11] Because the forces driving the economic and social growth are so different for the two parts of the overall study area, the analysis was performed separately for the municipalities in the 11 Minnesota counties of the Twin Cities metropolitan area and the remaining six non-metropolitan counties.

The characteristics used to group the municipalities were property tax base per household (2003), poverty rate (2000), household growth (1993 to 2003), and household density (2003), median age of the housing stock (2000) and jobs per household (2003).[12] The percentage of the housing stock that is seasonal (2000) and the percentage of the work force in agriculture (2000) were added to the analysis of the non-metropolitan portion of the study area because development related to tourism/resorts and agriculture are so important in that part of the region.

These demographic and fiscal variables provide a snapshot of a community in two dimensions—its ability to raise revenues from its local tax base and the costs associated with its social and physical needs. Fiscal capabilities are measured by tax base and jobs per household in the Twin Cities and by those variables plus the seasonal share of housing in the rest of the study area.

Measures of need capture a range of local characteristics that affect the cost of providing public services. High poverty is a well-documented contributor to public service costs. It both generates greater needs for services and increases the cost of reaching a given level of service. Both population declines and large increases tend to increase the per-person costs of long-lived assets like sewers, streets or buildings. When population declines, the costs of these assets must be spread across fewer taxpayers. When population is growing rapidly, the costs for new infrastructure tend to fall disproportionately on current residents (compared to future residents) because of the difficulty of spreading the costs over the full lifetime of the assets. Density is another important predictor of cost. Very low densities can increase per-person costs for public services involving transportation (like schools, police and fire protection) and for infrastructure (roads and sewers). Moderate to high densities, on the other hand, can help limit per-person costs. Housing age is used as a proxy for the age of the community's infrastructure—older infrastructure is more expensive to maintain.

These variables also capture a cross-section of the socioeconomic characteristics that define a community's character. Demographics, population growth, and density are among the factors people examine when deciding if a community is "their kind of place." Because of their unique history and characteristics, the Twin Cities central cities—Minneapolis and St. Paul,—were place in their own group before clustering.

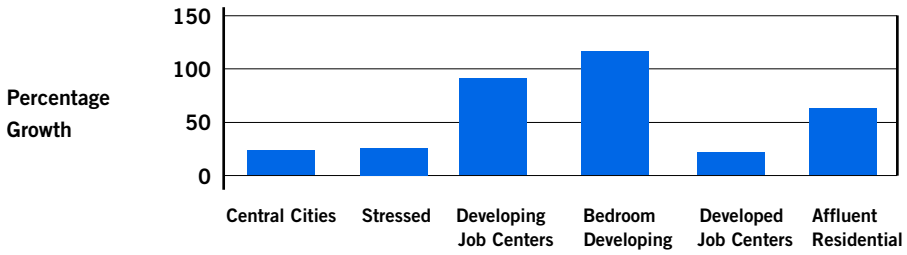
Sensitive Natural Areas and Growth

The final step in the analysis was to examine the relationships among projected growth patterns, the community classification, and the sensitive natural areas mapping in order to explore questions such as:

- *What types of communities are projected to grow more or less quickly than the region as a whole? Do these communities contain sensitive natural areas?*
- *If new growth proceeds in the future at densities like the recent past, will there be enough available land – land that is not sensitive, protected or already urbanized – in fast growth communities to accommodate future growth while also conserving sensitive natural areas for their many benefits?*

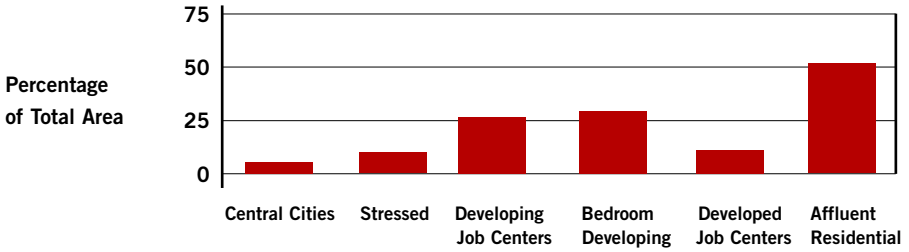
Much of the region's future growth is expected to occur in the 7-county core area. Of the projected 1,073,000 new residents in the 17-county Central Region, nearly 900,000 are expected in the core region with another 100,000 expected in the four adjacent collar counties. Figure 2 shows which types of communities in the 7 core counties are expected to show the greatest increases in households between 2003 and 2030. The greatest expected growth rates are found in communities classified as Developing Job Centers and Bedroom Developing. Although these two groups represented just 33 percent of households in the 7 counties in 2003, they are projected to receive 67 percent of growth in the coming decades. In short, much of the region's future growth is expected in relatively low-density, middle class communities at the fringe of the metropolitan area.

Figure 2: Projected Growth in Households 2003 – 2030 by Community Type Seven County Core Metropolitan Area



Source: See Map 3.

Figure 3: Percentage of Total Area: Non-urban, unprotected and sensitive by Community Type, 7 County Core Metropolitan Area



Source: See Map 4.

Figure 3 shows the distribution of unprotected, undeveloped sensitive natural areas across community types for the 7-county region. The Affluent Residential category shows the highest percentage of total land classified as non-urban, unprotected, and sensitive (53 percent) while the Bedroom Developing and Developing Job Center categories are second and third (29 and 27 percent). However, because the latter two classes represent so much more total land area, Bedroom Developing and Developing Job Centers contain fully 85 percent of the 7-county region's non-urban, unprotected, and sensitive areas.

In sum, two of the five community types—Developing Job Centers and Bedroom Developing—contain 85 percent of the area's non-urban, unprotected and sensitive natural areas and are expected to receive 67 percent of the 7-county area's future growth.

Growth produces tax base but it also creates demand for infrastructure, schools and public services. Given that they possess just average fiscal resources, Developing Job Centers and Bedroom Developing Communities are unlikely to be able to protect these sensitive resources alone. The costs of accommodating the bulk of the region's future growth will make it very difficult to also expend scarce local fiscal resources on natural resources conservation.

Tradeoffs that jeopardize important, sensitive natural resource areas can be ameliorated based on how communities grow. This is illustrated by looking at how much currently undeveloped land will be needed if future growth occurs at densities like those of the past.

Table 5 compares the amount of currently available land that will be needed to accommodate new households in each of the community types if each new household consumes as much land as current households.[13] "Available" is defined as non-urban, unprotected, non-sensitive land. The results show that, although the 7-county area as a whole has enough land to accommodate projected growth, there are shortfalls in available land for three of the six community classes. The most glaring shortfall is in those communities classified as Developing Job Centers—the classification expected to receive the most growth. If growth in these communities occurs at current densities, it would consume 98,000 more acres than is currently available, an area equivalent to the total areas of Minneapolis, St. Paul, and Bloomington combined (97,800 acres).

TRADEOFFS THAT JEOPARDIZE IMPORTANT, SENSITIVE NATURAL RESOURCE AREAS CAN BE AMELIORATED BASED ON HOW COMMUNITIES GROW.

Developing Job Centers contain about 118,000 acres of unprotected, non-urban, sensitive land. This means that, if these communities grow in the same manner they have grown in the past, one of two things must happen. Either, new growth will consume most or all of the remaining sensitive natural areas or new growth will be pushed further out into the fringes of the region. Developing job centers form a nearly complete ring around the region's core (Map 18). If they cannot accommodate all of the growth they are expected to receive, the most likely place for it to go is outward into the fringes of the 7-county region and the collar counties. It will be difficult for growth to be pushed inward since the communities inside the ring of Developing Job Centers—central cities, stressed suburbs and developed job centers—already are expected to grow at rates that will consume all, or nearly all available land there. Each of these community types shows either a shortfall or very small surplus of available land for development when sensitive natural areas are removed from development consideration (Table 5).

Another way to view the potential tradeoffs facing the region is to look at the growth projections in the context of the Metropolitan Council's Metropolitan Urban Services Area (MUSA). The MUSA is perhaps the most important tool that the Council uses to guide development in the region. It defines the area within which the council provides important regional infrastructure like wastewater conveyance and treatment. The primary objective of the MUSA is to ensure orderly, contiguous development as the region moves outward.

The current MUSA line forms a rough circle around the core of the region, passing through Andover, Blaine and Lino Lakes in the north, Woodbury and Lake Elmo in the east, Lakeville and Savage in the south, and around the western end of Lake Minnetonka and through Plymouth and Maple Grove in the west. Sixty-three municipalities lie completely within the current MUSA and another 38 are partly inside it.[14] Eighty-nine communities in the core region lie beyond the MUSA.

The bottom panel of Table 5 places projected population and calculations of available land in the context of the MUSA line. If the MUSA boundary were expanded out to include all of the area in the 38 municipalities currently split by the MUSA, this would add about 280,000 acres of new area inside the MUSA.[15] If each new household projected for this part of the region by 2030 consumes land at rates like the recent past, then there will be a shortfall of more than 115,000 acres of available land inside the expanded MUSA to accommodate future growth. This is true even though the 280,000-acre increase assumed for the purposes of this assessment is substantially more than the Metropolitan Council currently plans for future growth.

The shortfall of 115,000 acres represents about 65 percent of the non-urban, unprotected, sensitive land in these communities. This reinforces the conclusions from the calculations based on the community classification: if the region grows the way it has in the past, future growth will either have to occur beyond the areas targeted for development by the Metropolitan Council—primarily within the current MUSA and in areas immediately adjacent to it—or it will consume much of the region's remaining unprotected, sensitive natural areas.

© Julie Westerlund, Minnehaha Creek Watershed District

The overriding conclusion from each of the simulations is that we must find new ways to grow if we want to both conserve the region's remaining sensitive natural areas and avoid inefficient expansion into the far reaches of the metropolitan area. To do this while accommodating the amount of growth that is currently projected to 2030, new development on currently underdeveloped land must occur at greater densities than in the past or as "infill" development on already developed land. Further, even if new development occurs in ways that consume less land than in the past, it still must be directed to non-sensitive areas as much as possible—natural resource planning must play a significant role in local and regional land-use planning.

Table 5: Land Consumption from Projected Household Growth, 2003 – 2030, by Community Type, 7-County Region

Community Type	Projected Household Growth 2003-2030	Average Households per Acre of Urbanized Land 2002	Land Consumption 2003-2020 at 2002 Densities	Available Land* 2002	Surplus/Shortfall
Central Cities	52,480	4.2	12,698	1,424	(11,274)
Stressed	58,311	2.3	29,521	9,248	(20,273)
Developing Job Centers	228,551	1.3	201,867	103,868	(97,999)
Bedroom Developing	69,304	0.5	138,107	489,204	351,097
Developed Job Centers	43,997	1.8	31,202	35,932	4,730
Affluent Residential	5,820	0.9	9,533	7,770	(1,763)
Total	**458,463**	**1.7**	**422,928**	**647,446**	**224,517**

Land Consumption from Projected Household Growth, 2003 – 2030, Relative to the MUSA Line

	Projected Household Growth 2003-2030	Average Households per Acre of Urbanized Land 2002	Land Consumption 2003-2020 at 2002 Densities	Available Land* 2002	Surplus/Shortfall
Inside the Expanded MUSA	366,083	2.0	257,380	138,656	(118,733)
Outside the Expanded MUSA	92,380	2.3	165,539	508,789	343,250
Total	**458,463**	**1.7**	**422,928**	**647,446**	**224,517**

* Available lands defined as land that is not urbanized, protected, or sensitive.

Sources: Computed from data from the Twin Cities Metropolitan Council, U.S. Bureau of the Census, University of Minnesota Remote Sensing and Geospatial Laboratory, and Minnesota DNR.

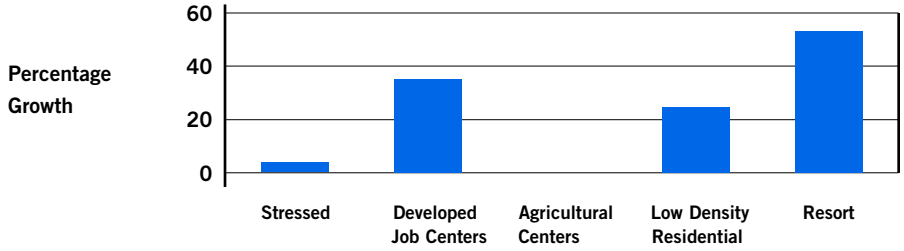
In the 6-county non-metropolitan region, the distributions of projected future growth and sensitive natural areas across community types are different from the metropolitan area in significant ways. Developed Job Centers and Resort areas are expected to grow the fastest (Figure 4). However, because current populations in Developed Job Centers are so much greater than in Resort areas, the bulk of this growth is expected in the Developed Job Centers—61 percent of projected growth is in these communities.

The greatest concentrations of unprotected, sensitive areas, on the other hand are in the Resort and Low Density Residential categories (Figure 5). Between them, these groups contain 83 percent of unprotected sensitive areas.

Thus, the greatest increases in population are expected in areas (Developed Job Centers) with lower than average concentrations of sensitive natural areas. However, the Resorts category both contains sensitive resources and is expected to expand significantly in the future. Resort communities are among the least-densely settled parts of the 6-county non-metropolitan region. Such high concentrations of sensitive resources imply that careful planning and appropriate private management for sensitive natural resources are very important. The high amenity value of these places clearly creates the potential for growth beyond current projections leading to negative natural resources impacts, such as triple tier lake development. With local tax capacities only moderately above average for the 6-county non-metropolitan region and below the average for the Twin Cities metropolitan area, resort communities might also struggle if left to conserve sensitive areas on their own.

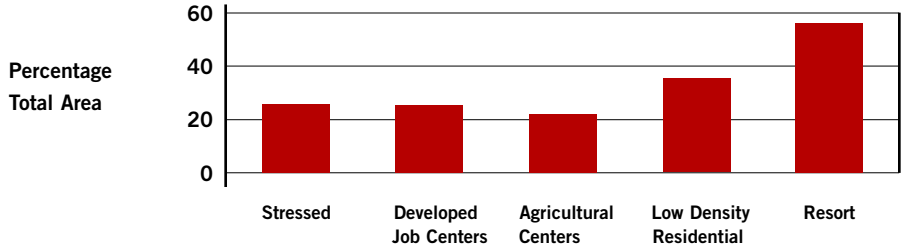
As in the metropolitan area, this assessment clearly suggests that if natural resources are to sustain the region's economy and communities into the future, serious consideration and efforts must be made at all levels to better plan and budget for the conservation of sensitive natural areas.

Figure 4: Projected Growth, 2003 – 2030 by Community Type
6 Non-metropolitan Counties



Source: See Map 12.

Figure 5: Percentage of Total Area Unprotected and Sensitive by Community Type
6 Non-metropolitan Counties



Source: See Map 4.

Findings and Conservation Options for the Future

Central Minnesota's wealth of natural resources has been a driving force in the region's vitality since the times of European settlement. Formerly providing raw materials to support the region's growth, natural habitats today provide the foundation for the region's high quality of life. Increasingly, however, growth is threatening these very resources. The fact that natural resources both attract growth, and are often consumed by that growth, poses important and unaddressed conservation challenges.

Key Findings

Finding 1: DNR's Central Region retains a diversity of important natural habitats scattered throughout its region that provide conservation opportunities for the future. Although about 40 percent of Central Region's total surface area is considered as having sensitive natural resources, an estimated 14 percent of the entire region is covered with remnant land and water habitats of highest sensitivity that merit serious conservation consideration.

Finding 2: Water availability is an invisible and often forgotten resource constraint to growth and development, especially beyond the reach of the core region's deep aquifers. As development in the Twin Cities metropolitan area moves outward, it becomes increasingly reliant on shallow and poorly identified buried and surficial sand aquifers rather than deep aquifers. While surface water sources are available beyond the core region, there are increased costs and uncertainty associated with these water supplies.

Finding 3: Current patterns of low-density development are consuming land at a much greater rate than population is growing. In the core 7-county region, previously undeveloped land was converted to urban uses at a rate one and a half times the population growth rate between 1984 and 2002.

Finding 4: Continued low-density development potentially threatens sensitive natural areas throughout DNR's Central Region. In both the metropolitan and non-metropolitan portions of the region, water, woods, and open views are highly valued and sought after for the value they add to properties and quality of life. The increasing trend of dispersed, small job centers and home-based employment enables spread out, low-density living that often jeopardizes sensitive natural habitats and scenic open spaces. If projected development in the metropolitan area, in particular, continues at densities like the recent past, the region faces a no-win situation resulting in inefficient expansion of the urbanized area, loss of much of the region's remaining, non-publicly-owned, sensitive natural areas, or a combination of the two.

Finding 5: The fiscal resources available to local governments vary widely across the region; many of the areas directly in the path of growth lack resources needed to protect sensitive natural areas on their own. Current forecasts project that 67 percent of growth in the 7-county core region during the next three decades will occur in middle class communities with modest fiscal capacities. These municipalities also contain 85 percent of the unprotected sensitive natural areas in the region.

Conserving Sensitive Natural Areas in a Growing Region: Options for the Future

The intent of this assessment was to gain greater understanding of the implications of growth and development on remaining sensitive natural resource areas in DNR Central Region and to identify reasonable, proactive approaches that might be tried by the DNR and others in the region to conserve vital resources.

Reconciling the requirements of a growing metropolitan region with the need to conserve sensitive natural areas constitutes a complex challenge because:

- *Regional planning is fragmented in the Central Region, with only municipalities in the 7 core counties guided in their growth by the Metropolitan Council, with its staged provision of infrastructure – wastewater treatment facilities, sewers, roads, airports, regional parks and park reserves.*
- *The forces driving growth, development, and loss of sensitive resources differ between the 11-county metropolitan areas and the six non-metropolitan counties.*
- *The region retains a wide diversity of sensitive land and water habitat patches that both attract development, and increase land prices, making conservation measures very expensive.*

Many of the social and economic pressures on natural resources examined by this joint research effort span governmental boundaries, policy boundaries, and disciplinary boundaries. Potential solutions must do the same. Above all, it is imperative that there be increased cooperation among the many public and private actors in order to plan and budget for the conservation of sensitive natural habitats that contribute to a healthier, more secure regional future.

Working Across Boundaries

An important element of natural resources conservation in today's fragmented landscapes is recreating connections, whether it is to facilitate the movement of water, organisms, or air. Just as roadways and sewer systems work best when planned for at a regional scale, so to do natural habitats. Working across boundaries can produce better outcomes.

The primary planning issue in the 11-county metropolitan area is how to accommodate large numbers of new households without excessive expansion into sensitive areas that remain just beyond the already urbanized part of the region. In the near term, much of this growth is expected within the 7 counties, where the Metropolitan Council provides a regional voice in the planning process. However, the four collar counties are also expected to experience rapid growth. Coordinating growth planning in the collar counties with Metropolitan Council policies will become more and more important as the region expands. Bringing the collar counties into the Metropolitan Council's planning process is one way to do this. Short of that, greater cooperation among the collar counties to facilitate closer coordination with the Metropolitan Council, and the Mn DNR, is an alternative to achieve a balance between growth and conservation.

Closer collaboration between DNR's Central Region and the Metropolitan Council in the identification and acquisition of natural areas that are beyond the interest or financial wherewithal of local governments could markedly enhance regional conservation efforts. The DNR's 7-county regional ecological assessment (2003), funded in part by the Metropolitan Council, provides a sound foundation on which to base regional conservation collaboration within the metropolitan area.

Internally, DNR's Central Region needs to expand its identification and prioritization of natural resource areas deserving of protection and restoration to its entire 17-county region. By working with its various agency disciplines and local communities, sensitive resources in the path of rapid growth can be prioritized for attention.

In addition to regional templates for conservation action, the DNR, Metropolitan Council, and other conservation-oriented organizations need to encourage natural resource-based comprehensive planning at the local level

to support regional plans. Strong encouragement needs to be provided to every municipality to apply natural resources information in order to identify sensitive natural areas for conservation, to direct development to less sensitive areas, and to incorporate natural resources into plans, budgets, and designs for physical infrastructure like roads and utility corridors. In this way, communities will become more aware of the need to consider conserved natural areas as "must haves", not just "nice things to have".

In the more rural counties, well beyond the influence of the Metropolitan Council, development impacts due to low density development and redevelopment associated with recreational and retirement homes will continue to affect sensitive natural areas like lakeshores. In the non-metropolitan counties, where natural resources play a very important role, conservation will benefit from natural resource-based planning and more and better cooperation among DNR staff, private landowners, and county, municipal, and other local planning authorities.

Sharing the Costs of Conservation

In the context of rapid growth and increasing disparities in DNR's Central Region, which were illuminated by this assessment, reducing the negative fiscal impacts of natural resources conservation becomes an important goal. While the many, important benefits derived from natural habitats, like flood and storm water control, water purification, and outdoors recreation are often regional in scope, many of the costs associated with conservation are borne locally. As a result, reliance primarily on local governments for natural resources conservation is likely to result in too little conservation from the point of view of the region (or state) as a whole.

Regional and statewide policies that regulate the behavior of local governments are unpopular among local officials because they usually involve costs to local governments, for which they are seldom compensated. More stringent regulations by regional or state agencies to conserve sensitive natural areas, especially at the edges of the core region where natural habitats still exist, almost certainly impose costs on local areas. Development in or near sensitive natural habitats is highly desirable, and limiting local prerogatives to develop sensitive areas imposes costs in the form of lost local tax base.

This suggests that responsibility for natural resource conservation and the associated costs need to be shared by many, including local units of government, regional institutions like the Twin Cities Metropolitan Council, state government, nongovernmental organizations, and the private sector.

The 7-county core of the metropolitan area already has a unique institution, which, if expanded, could meet at least some of the equity concerns raised by regional or state limitations on the development of sensitive lands by municipalities. The region's Fiscal Disparities Program since 1971 has combined 40 percent of the increase in commercial-industrial tax base in each municipality into a regional pool. The pooled tax base is then redistributed to municipalities according to their population and total market value of property. The lower a place's market value per capita, the more tax base it receives from the pool. This means that municipalities that forego development of sensitive lands (and the market value increases associated with that development) are compensated to some extent for that decision. Tax-base sharing effectively encourages sensible land use planning, especially when governance is as fragmented as it is in the Central Region. [16]

Coupling more regional guidance of local land use decisions with expansion of the Fiscal Disparities Program would reduce the potential costs of conserving sensitive natural areas in places rich in resources. For instance, the current Fiscal Disparities Program clearly helps the developing suburbs that are most likely to face difficult trade-offs between development and resource conservation in the coming years. Of the 102 municipalities in the 7-county core region in the Developing Job Center and Bedroom Developing classifications, 88 (or 86 percent) currently receive more tax base from the pool than they contribute.

Similarly, expanding Fiscal Disparities to include the next ring of counties likely to face these tradeoffs—Chisago, Isanti, Sherburne and Wright—would benefit the vast majority of places in those counties as well. If they had been part of the program from its inception, 78 out of the 88 municipalities would now be receiving more tax base from the pool than they contributed and a typical municipality would receive enough to increase its tax capacity by 11 percent. These communities now contain 80 percent of the population in the collar counties. [17]

In addition to the Fiscal Disparities Program, a variety of other fiscal incentives are also available to ease local costs associated with natural resource conservation in the Region. These include:

- *Revising the formula for the Local Government Aid system to compensate communities most affected by conservation efforts;*
- *Encouraging the Metropolitan Council to broaden its Regional Parks and Open Space mission to include acquisition of sensitive natural areas for purposes other than parks and park reserves, such as education and passive recreational opportunities.*
- *Encouraging the Minnesota Legislature to increase funding to the Minnesota Department of Natural Resources, Metropolitan Council's Parks and Open Space System, and to local units of government to accelerate land and water conservation in high growth areas of the region.*
- *Provision of monetary incentives to local units of government to conduct natural resource/land cover inventories to be used as the basis for natural resource-based local comprehensive planning;*
- *Participation in Minnesota DNR's Metro Greenways Program, the Metro Conservation Corridors Partnership, and Minnesota Habitat Corridor Partnership;*
- *Providing various kinds of tax incentives to private landowners to conserve land and water.*

Bridging the Gaps

Conserving sensitive resources as the region grows into the future requires more than collaborative planning and financing for land conservation. It also requires new information, analyses of changing conditions, provision of assistance, and creative and innovative changes to enhance desired outcomes. While there are many gaps to address, some key issues to be considered, as suggested by this study, include:

- *Support for accelerated groundwater mapping and monitoring in selected fast-growth communities where water supply is constrained in order to avoid inefficient growth;*
- *Seed funds to support local land cover inventories for purposes of land use planning;*
- *Community outreach to fast growth communities in DNR's Central Region in order to generate greater public awareness of the importance of public and private conservation efforts to overall community health;*
- *Development of local examples that economically justify low impact development and conservation design, especially to fiscally strapped communities; and*
- *Changes to regulations, ordinances, codes, and environmental review that enable a shift from conventional planning and design in support of more creative low impact design and conservation development. Adjustments to the environmental review process could also make the review process more proactive, less burdensome, and more effective at conserving habitat by addressing area-wide rather than site-by-site development impacts.*

Endnotes

1 Orfield, Myron, *American Metropolitics: The New Suburban Reality,* Brookings Institution, Washington D.C. 2002.

2 Metropolitan Council, news release, July 19, 2005.

3 Consistent urbanization data were not available over the full time period for the 17-county region.

4 See Yuan, Fei, Kali E. Sawaya, Brian C. Loeffelholz and Marvin E. Bauer, "Land Cover Classification and Change Analysis of the Twin Cities (Minnesota) Metropolitan Area by Multitemporal Landsat Remote Sensing," *Remote Sensing and the Environment* 98 (2005), 317-328 for a complete description of the methods used to classify land uses.

5 The Census Transportation Planning Package was used to find the job centers and analyze commuting patterns.

6 Inner suburbs are defined as municipalities bordering one of the central cities. Middle suburbs are municipalities bordering an inner suburb. Outer suburbs are the remainder.

7 The commuter-sheds were generated from Census Transportation Planning Package journey to work data shown by Traffic Analysis Zones (TAZ). TAZ's are usually slightly smaller than census tracts. The commuter-sheds were derived by finding the circumference of TAZ's around the job center with the relevant median travel time and smoothing the contour using Inverse Distance Weighting (IDW) interpolation. IDW estimates values for areas by averaging from surrounding values of point samples, giving greater weight to nearby points. The commuter-shed boundaries were interpolated from TAZ commuting times, using the TAZ centroids as the point samples. IDW was used with the Geostatistical Analyst extension to ESRI's ArcMap.

8 Minnesota Department of Administration, Office of the State Demographer; "Projected Population to 2030 for Cities and Townships Outside the Twin Cities Area"; http://server.admin.state.mn.us/resource.html?Id=7376

9 See http://www.dnr.state.mn.us/rsea/map.html.

10 See "Voters being asked to raise taxes for parks," Star Tribune, November 2, 2005, p. B1.

11 Grouping was accomplished using the K-means clustering procedure in SPSS. For more on cluster analysis in general, and K-means clustering in particular, see *StatSoft, Inc. Electronic Statistics Textbook* (Tulsa, OK: StatSoft, 2002) at www.statsoft.com/textbook/stathome.html.

12 All variables were standardized—expressed as the number of standard deviations from the mean—to minimize scale effects.

13 Densities and land consumption were calculated separately for each municipality. Density was estimated as 2002 households divided by 2002 land classified as urbanized. Land consumption was estimated by this density times the number of projected new households for the municipality. Total land consumption for a community type is the sum of estimated land consumption for each of the municipalities in the group.

14 Municipalities with 97 percent or more of their land inside the MUSA were treated as completely within the MUSA for these calculations.

15 The Metropolitan Council currently plans to expand the MUSA by significantly less—by 121,637 acres in 2020 or about 21 percent of current area inside the MUSA. (This was calculated with GIS data from the Metropolitan Council at http://www.datafinder.org.) However, since the planned MUSA expansion does not follow municipality boundaries while the population projections do, it is not possible to match population changes and MUSA changes acre by acre.

16 See Burchell, Robert W., Anthony Downs and Sahan Mukherji, *Sprawl Costs: Economic Impacts of Unchecked Development,* Island Press, Washington D.C. 2005 and Orfield, Myron, *American Metropolitics: The New Suburban Reality,* Brookings Institution, Washington D.C. 2002.

17 The findings for the current program and the expansion to the collar counties were calculated from work performed by Steve Hinze of the Research Department of the Minnesota House of Representatives.

ameregis

1313 Fifth Street SE, Suite 119
Minneapolis, MN 55414
(612) 379-3926
www.ameregis.com

Central Region
1200 Warner Road
St. Paul, MN 55106
(651) 772-7900
www.dnr.state.mn.us